

DANA CAMELIA DIACONU

ENGLISH FOR ENGINEERING

Part II

VOCABULARY

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Television

Television is a telecommunication system for **broadcasting** and receiving **moving pictures** and **sound** over a distance. The term has come to refer to all the aspects of television from the television set to the programming and transmission.

The word is derived from mixed Latin and Greek roots, meaning “far seeing” (Greek “tele,” meaning far, and Latin “visus,” meaning seeing).

The origins of what would become today’s television system can be traced back as far as the discovery of the photoconductivity of the element selenium by Willoughby Smith in 1873, and the invention of a **scanning** disk by Paul Nipkow in 1884. All practical television systems use the fundamental idea of scanning an image to produce a time series signal representation. That representation is then transmitted to a device to reverse the scanning process. The final device, the television, relies on the human eye to integrate the result into a coherent image.

The first modern television broadcasts were made in England in 1936. Television did not become common in United States homes until the middle 1950s. While North American over-the-air broadcasting was originally free of direct marginal cost to the consumer and broadcasters were compensated primarily by receipt of advertising revenue, increasingly United States television consumers obtain their programming by subscription to cable television systems or direct-to-home satellite transmissions. In the United Kingdom, on the other hand, the owner of each television must pay a license fee annually which is used to support the British Broadcasting Corporation.

The elements of a simple television system are:

An image source - this may be a camera for live pick-up of images or a flying spot scanner for transmission of films.

A sound source.

A transmitter, which **modulates** one or more television signals with both picture and sound information for transmission.

A receiver (television) which recovers the **picture and sound signals** from the television broadcast.

A display device turns the electrical signals into visible light and audible sound.

Practical television systems include equipment for selecting different image sources, mixing images from several sources at once, insertion of **pre-recorded** video signals, synchronizing signals from many sources, and **direct image generation** by computer for such purposes as station identification. Transmission may be over the air from land-based **transmitters**, over metal or optical cables, or by radio from synchronous satellites. Digital systems may be inserted anywhere in the chain to provide better image transmission quality, reduction in transmission **bandwidth**, special effects, or security of transmission from theft by **non-subscribers**.

Reading and vocabulary:

1. What is Television?
2. What is the origin of the word *television*?
3. Which is the fundamental idea that television systems use?
4. Where and when were the first broadcasts made?
5. Which are the elements of the television systems?
6. How may the transmission be done?
7. Why is television so important?

Look up and find the meaning of the words:

Telecommunication-telecomunicatie
Broadcasting-transmissione,transmitere
Transmission-tranmission
Photoconductivity-fotoconductivitate
Scanning-scanare
Satellite-sateliti
Receiver-receptor
Display-ecran
Bandwidth-la time de banda
Subscriber-abonata
to modulate-a scimba

Match the words or the expressions with their definitions:

- | | |
|------------|---|
| 1. adapter | a. a part that electrically or physically connects a device to a computer or to |
|------------|---|

another device

- | | |
|------------------------|--|
| 2. ampere (A) | b. a high-temperature conditioning of magnetic material to relieve stresses introduces when the material was formed |
| 3. analog device | c. a microcircuit in which the output is a mathematical function of the input |
| 4. anneal | d. a device that is the beginning point for getting radio, TV or similar signals, for the final point for transmitting them |
| 5. antenna | e. the robot state in which automatic operations can be initiated |
| 6. application | f. to run the robot by executing a program |
| 7. automatic mode | g. a program or group of programs that perform given task; a smaller form of an application is an applet |
| 8. automatic robot run | h. a unit used to define the rate of flow of electricity (current) in a circuit; units are one coulomb ($6,28 \times 10^{18}$ electronics) per second |

Video

Video is the technology of capturing, recording, processing, transmitting, and reconstructing moving pictures, typically using celluloid film, electronic signals, or digital media, primarily for viewing on television or computer monitors.

The term video (from the Latin for “I see”) commonly refers to several storage formats for moving pictures: digital video formats, including DVD, QuickTime, and MPEG-4; and analog videotapes, including VHS and Betamax. Video can be recorded and transmitted in various physical media: in celluloid film when recorded by mechanical cameras, in PAL or NTSC electric signals when recorded by video cameras or in MPEG-4 or DV digital media when recorded by digital cameras.

Quality of video essentially depends on the capturing method and storage used. Digital television (DTV) is a relatively recent format with higher quality than earlier television formats and has become a standard for television video.

3D-video, digital video in three dimensions, premiered at the end of 20th century. Six or eight cameras with real-time depth measurement are typically used to capture 3D-video streams. The format of 3D-video is fixed in MPEG-4 Part 16 Animation Framework eXtension (AFX).

In the UK, Australia, and New Zealand, the term video is often used informally to refer to both video recorders and video cassettes; the meaning is normally clear from the context.

Frame rate, the number of still pictures per unit of time of video, ranges from six or eight frames per second (fps) for old mechanical cameras to 120 or more frames per second for new professional cameras. PAL (Europe, Asia, Australia, etc.) and SECAM (France, Russia, parts of Africa etc.) standards specify 25 fps, while NTSC (USA, Canada, Japan, etc.) specifies 29.97 fps. Film is shot at the slower frame rate of 24fps. To achieve the illusion of a moving image, the minimum frame rate is about ten frames per second.

Video can be interlaced or progressive. Interlacing was invented as a way to achieve good visual quality within the limitations of a narrow bandwidth. The horizontal scan lines of each interlaced frame are numbered consecutively and partitioned into two fields: the odd field consisting of the odd-

numbered lines and the even field consisting of the even-numbered lines. **NTSC**, PAL and SECAM are interlaced formats. Abbreviated video resolution specifications often include an “*I*” to indicate interlacing. For example, PAL video format is often specified as 576i50, where 576 indicates the horizontal resolution, “*I*” indicates interlacing, and 50 indicate 50 (single-field) frames per second.

Reading and vocabulary:

1. What is the video technology?
2. What is the origin of the term *video*?
3. What does this term refer to?
4. When did 3D-videos first appear?
5. What does the term video refer to in Australia, UK and New Zealand?
6. What is the frame rate?
7. What does the abbreviation "I" indicate?
8. Why is the video technology so important?

Look up and find the meaning of the words:

Capture-registraa
record
process-a procesa
transmit-transmita
reconstruct-reconstrui
moving picture -imagine miscare
celluloid film- film pe celluloid
electronic signal-semnal electronic
digital media-media digital
view -viziona
storage-spatiu de stocare
framework-cadrela
frame rate-frekventa cadrelor
interlacing-intercalare
progressive-progresiv

Make sentences using the following words:

capturing
recording
processing
transmitting
reconstructing
moving pictures
celluloid film
electronic signals
digital media
viewing

storage
resolution

Match the words or the expressions with their definitions:

- | | |
|---------------------------------------|---|
| 1. backbone-
coloana
vertebrala | a. a set of nodes and their interconnecting links that form a central, high-speed network interconnecting other, typically lower-speed, networks or client nodes |
| 2. backup,d | b. abbreviation for "binary digit", it is the smallest piece of computer information, either the number 0 or 1 |
| 3. back-up,g
(of data) | c. a term used in video monitor technology to modify how much voltage is sent to the display area of the monitor or screen, making the background and foreground images lighter or darker |
| 4. bit,b | d. important procedure of saving data on a separate data storage device to prevent complete data loss in case of unexpected failure of main storage system |
| 5.
brightness,c | e. a hard-plastic tube, having an inside diameter several times that of a fiber, that holds one or more fibers |
| 6.
broadcast,f | f. a transmitted frequency signal for radio, television or similar communications |
| 7. buffer
tube,e | g. a system, device, file or facility that can be used as an alternative in case of a malfunction or loss of data |
| 8. bug,h | h. a problem with computer software that causes it to malfunction or crash |

9. bus,^j i. 8 bits of data, the basic measurement of the amount of data
10. byte,ⁱ j. a bus is a communication path between different components in a computer; a bus is typically composed of address wires, data wires and control wires. For example, a computer's central processing unit (CPU) and memory are usually connected via a bus

Computers

A **computer** is a machine for manipulating data according to a list of instructions known as a program.

Computers are extremely versatile. In fact, they are universal information-processing machines. A computer with a certain minimum threshold capability is in principle capable of performing the tasks of any other computer, from those of a personal digital assistant to a supercomputer, as long as time and memory capacity are not considerations. Therefore, the same computer designs may be adapted for tasks ranging from processing company payrolls to controlling unmanned spaceflights. Due to technological advancement, modern electronic computers are exponentially more capable than those of preceding generations.

Computers take numerous physical forms. Early electronic computers were the size of a large room, and such enormous computing facilities still exist for specialized scientific computation - supercomputers - and for the transaction processing requirements of large companies, generally called mainframes. Smaller computers for individual use, called personal computers, and their portable equivalent, the laptop computer, are ubiquitous information-processing and communication tools and are perhaps what most non-experts think of as "a computer". However, the most common form of computer in use today is the embedded computer, small computers used to control another device. Embedded computers control machines from fighter aircraft to digital cameras.

Originally, the term "computer" referred to a person who performed numerical calculations, often with the aid of a

mechanical calculating device or analog computer. Examples of these early devices, the ancestors of the computer, included the abacus and the Antikythera mechanism, an ancient Greek device for calculating the movements of planets, dating from about 87 BC. The end of the Middle Ages saw a reinvigoration of European mathematics and engineering, and Wilhelm Schickard's 1623 device was the first of a number of European engineers to construct a mechanical calculator. The abacus has been noted as being an early computer, as it was like a calculator in the past.

In 1801, Joseph Marie Jacquard made an improvement to existing loom designs that used a series of punched paper cards as a program to weave intricate patterns. The resulting Jacquard loom is not considered a true computer, but it was an important step in the development of modern digital computers.

Charles Babbage was the first to conceptualize and design a fully programmable computer as early as 1820, but due to a combination of the limits of the technology of the time, limited finance, and an inability to resist tinkering with his design, the device was never actually constructed in his lifetime. A number of technologies that would later prove useful in computing, such as the punch card and the vacuum tube had appeared by the end of the 19th century, and large-scale automated data processing using punch cards was performed by tabulating machines designed by Hermann Hollerith.

During the first half of the 20th century, many scientific computing needs were met by increasingly sophisticated, special-purpose analog computers, which used a direct mechanical or electrical model of the problem as a basis for computation. These became increasingly rare after the development of the programmable digital computer.

A succession of steadily more powerful and flexible computing devices were constructed in the 1930s and 1940s, gradually adding the key features of modern computers, such as the use of digital electronics and more flexible programmability. Defining one point along this road as "the first digital electronic computer" is exceedingly difficult. Notable achievements include the Atanasoff-Berry Computer (1937), a special-purpose machine that used valve-driven (vacuum tube) computation, binary numbers, and regenerative memory; the secret British Colossus computer (1944), which

had limited programmability but demonstrated that a device using thousands of valves could be made reliable and reprogrammed electronically; the Harvard Mark I, a large-scale electromechanical computer with limited programmability (1944); the decimal-based American ENIAC (1946) — which was the first general purpose electronic computer, but originally had an inflexible architecture that meant reprogramming it essentially required it to be rewired; and Konrad Zuse's Z machines, with the electromechanical Z3 (1941) being the first working machine featuring automatic binary arithmetic and feasible programmability.

The team who developed ENIAC, recognizing its flaws, came up with a far more flexible and elegant design, which has become known as the Von Neumann architecture (or “stored program architecture”). This stored program architecture became the basis for virtually all modern computers. A number of projects to develop computers based on the stored program architecture commenced in the mid to late-1940s; the first of these were completed in Britain.

Valve-(tube) driven computer designs were in use throughout the 1950s, but were eventually replaced with transistor-based computers, which were smaller, faster, cheaper, and much more reliable, thus allowing them to be commercially produced, in the 1960s. By the 1970s, the adoption of integrated circuit technology had enabled computers to be produced at a low enough cost to allow individuals to own a personal computer.

Reading and vocabulary:

1. What is a computer?
2. What does the term “computer” originally refer to?
3. Give examples of early devices, the ancestors of the computer.
4. What was ENIAC?
5. Who was the first to conceptualize and design a fully programmable computer?
6. What replaced the transistor-based computers?
7. Why are computers so important?

Look up and find the meaning of the words:

manipulating
 versatile
 threshold capability
 payrolls
 unmanned
 mainframes
 ubiquitous
 embedded
 punched
 to weave
 intricate
 patterns
 to conceptualize
 tinkering
 tabulating

Match the words or expressions with their definitions:

- | | |
|--|--|
| 1. CMOS
(Complementary Metal
Oxide
Semiconductor) | a. a memory chip which keeps a data record of the components installed in a computer. The CMOS uses the power of a small battery and retains data even when computer is turned off. CMOS is used by a computer to store PC's configuration settings, such as date, time, boot sequence, drive(s) parameters etc. |
| 2. conductivity | b. a collection of similar information stored in a file, such a database or addresses, with a given structure for accepting, sorting and providing, on demand, data for multiple users |
| 3. conductors | c. any piece of control hardware such as an emergency-stop button, selector switch, control pendant, relay, solenoid valve, sensor etc. |
| 4. conductor | d. the computing term for information |
| 5. data | e. materials that allow electrical charges |

to flow through them

- | | |
|-------------------|--|
| 6. database | f. a measure of the ease with which electrical carriers flow in a material: the reciprocal of resistivity |
| 7. decibel | g. a software module that hides the details of a peripheral and provides a high-level programming interface to it |
| 8. decimal | h. refers to a base ten number system using the characters 0 through 9 to represent values |
| 9. device | i. anything that allows the passage of electrons; a material or object through which electricity can flow with little resistance |
| 10. device driver | j. information indicating the nature or location of a malfunction |
| 11. diagnostic | k. a standard logarithmic unit for the ratio of two powers, voltage or currents; in fiber optics the ratio is power |

How computers work

While the technologies used in computers have changed dramatically since the first electronic, general-purpose computers of the 1940s, most still use the stored program architecture. The design made the universal computer a practical reality.

The architecture describes a computer with **four main sections**: the arithmetic and logic unit (ALU), the control circuitry, the memory, and the input and output devices (I/O). These parts are interconnected by bundles of wires and are usually driven by a timer or clock (although other events could drive the control circuitry).

Conceptually, a computer's memory can be viewed as a list of cells. Each cell has a numbered "address" and can store a small, fixed amount of information. This information can either be an instruction, telling the computer what to do, or data, the information which the computer is to process using the instructions that have been placed in the memory. In principle, any cell can be used to store either instructions or data.

The **ALU** is in many senses the heart of the computer. It is capable of performing two classes of basic operations. The first is arithmetic operations; for instance, adding or subtracting two numbers together. The set of arithmetic operations may be very limited; indeed, some designs do not directly support multiplication and division operations. The second class of ALU operations involves comparison operations: given two numbers, determining if they are equal, or if not, equal which is larger.

The **I/O** systems are the means by which the computer receives information from the outside world and reports its results back to that world. On a typical personal computer, **input devices** include objects like the keyboard and mouse, and **output devices** include computer monitors, printers and the like, but as will be discussed later a huge variety of devices can be connected to a computer and serve as I/O devices.

The control system ties this all together. Its job is to read instructions and data from memory or the I/O devices, decode the instructions, providing the ALU with the correct inputs according to the instructions, "tell" the ALU what operation to perform on those inputs, and send the results back to the memory or to the I/O devices. One key component of the control system is a counter that keeps track of what the

address of the current instruction is; typically, this is incremented each time an instruction is executed, unless the instruction itself indicates that the next instruction should be at some other location (allowing the computer to repeatedly execute the same instructions).

Since the 1980s the ALU and control unit (collectively called a central processing unit or CPU) have typically been located on a single integrated circuit called a **microprocessor**.

The functioning of such a computer is in principle quite straightforward. Typically, on each clock cycle, the computer fetches instructions and data from its memory. The instructions are executed, the results are stored, and the next instruction is fetched. This procedure repeats until a halt instruction is encountered.

The set of instructions interpreted by the control unit, and executed by the ALU, are limited in number, precisely defined, and very simple operations. Broadly, they fit into one or more of four categories:

- 1) moving data from one location to another;
- 2) executing arithmetic and logical processes on data;
- 3) testing the condition of data;
- 4) altering the sequence of operations.

Instructions, like data, are represented within the computer as binary code - a base two system of counting. The particular instruction set that a specific computer supports is known as that computer's machine language. Using an already-popular machine language makes it much easier to run existing software on a new machine; consequently, in markets where commercial software availability is important suppliers have converged on one or a very small number of distinct machine languages.

Larger computers, such as some minicomputers, mainframe computers, servers, differ from the model above in one significant aspect; rather than one CPU they often have a number of them. Supercomputers often have highly unusual architectures significantly different from the basic stored-program architecture, sometimes featuring thousands of CPUs, but such designs tend to be useful only for specialized tasks.

Reading and vocabulary:

- 1) Which are the four main sections of a computer?
- 2) What is ALU?
- 3) What is I/O?

- 4) How can the computer's memory be viewed?
- 5) Which are the input devices?
- 6) Which are the output devices?
- 7) What is the microprocessor?

Look up and find the meaning of the words:

circuitry	division
input device	straightforward
output device	broadly
subtracting	altering
multiplication	availability

Match the words or expressions with their definitions:

- | | |
|---------------|--|
| 1. dial-up | a. a type of communication that is established by a switched-circuit connection using the telephone network |
| 2. dielectric | b. messages sent electronically between networked computers that may be across the office or around the world |
| 3. e-mail | c. the signal or signals received from a controlled machine or process to denote its response to the command signal; a signal which is transferred from the output back to the input for use in a closed-loop system |
| 4. fax | d. a system designed to prevent unauthorized access to or from a private network; all messages entering or leaving the intranet pass through system, which examines each message and blocks those that do not meet the specified security criteria |
| 5. feedback | e. non-conductor of electricity; the ability of a material to resist the flow of an electric current |
| 6. firewall | f. short for Facsimile, a fax is a scanned document that is sent over phone lines to |

a fax machine or computer with fax capabilities

- 7. firmware g. is called so because the entire sections of the microchip are erased at once or flashed. Flash memory cards lose power when they are disconnected (removed) from PC, yet the data stored in it is retained for indefinitely long time until it is rewritten
- 8. flash h. a flexible magnetic media with a typical
memory capacity of 1.44 MB
(card)
- 9. floppy i. permanent set of instructions and data
disk programmed directly into the circuitry of
 read-only memory for controlling the
 operation of the computer or disk drive.

Scanners

A scanner is a device that can read text or illustrations printed on paper and translate the information into a form the computer can use. A scanner works by digitizing an image - dividing it into a grid of boxes and representing each box with either a zero or a one, depending on whether the box is filled in. For color and grey scaling, the same principle applies, but each box is then represented by up to 24 bits. The resulting matrix of bits, called a **bit map**, can then be stored in a file, displayed on a screen, and manipulated by programs. Optical scanners do not distinguish text from illustrations; they represent all images as bit maps. Therefore, you cannot directly edit text that has been scanned. To edit text read by an optical scanner, you need an **optical character recognition** (OCR) system to translate the image into ASCII characters. Most optical scanners sold today come with OCR packages.

Scanners differ from one another in the following respects:

- scanning technology: most scanners use **charge-coupled device** (CCD) arrays, which consist of tightly packed rows of light receptors that can detect variations in light intensity and frequency. The quality of the CCD array is probably the single most important factor affecting the quality of the scanner. Industry-strength drum scanners use a different technology that relies on a **photomultiplier tube** (PMT), but this type of scanner is much more expensive than the more common CCD-based scanners.

- resolution: the denser the bit map, the higher the resolution. Typically, scanners support resolutions of from 72 to 600 dpi.

- bit depth: the number of bits used to represent each pixel. The greater the bit depth, the more colours or greyscales can be represented. For example, a 24-bit colour scanner can represent 2 to the 24th power (16.7 million) colours. Note, however, that a large colour range is useless if the CCD arrays are capable of detecting only a small number of distinct colours.

- size and shape: some scanners are small hand-held devices that you move across the paper. These **hand-held scanners** are often called half-page scanners because they can only scan 2 to 5 inches at a time. Hand-held scanners are

adequate for small pictures and photos, but they are difficult to use if you need to scan an entire page of text or graphics.

Larger scanners include machines into which you can feed sheets of paper. These are called **sheet-fed scanners**. Sheet-fed scanners are excellent for loose sheets of paper, but they are unable to handle bound documents.

A second type of large scanner, called a **flatbed scanner**, is like a photocopy machine. It consists of a board on which you lay books, magazines, and other documents that you want to scan.

Overhead scanners (also called copy board scanners) look somewhat like overhead projectors. You place documents face-up on a scanning bed, and a small overhead tower moves across the page.

Reading and vocabulary:

1. What is a scanner?
2. What is a bit map?
3. What does the abbreviation OCR refer to?
4. How do Scanners differ from one another?
5. What is a charge-coupled device?
6. What does the abbreviation PMT refer to?
7. How many types of scanners does the text refer to?

Look up and find the meaning of the words:

digitizing
to distinguish
photomultiplier tube
resolution
greyscales
hand-held
sheet-fed
flatbed scanner
overhead scanner

Match the words or the expressions with their definitions:

1. GSM a. abbreviation for Global System for Mobile communications
2. hard disk b. a data error that does not go away with type (unlike the soft error) and is usually caused by defects in the physical structure of the disk
3. hard error c. a device used to transfer heat from one substance to another; can be air to air, air to liquid, or almost any combination
4. hardware d. acoustical waves with frequency content below the frequency of the human ear, typically below 20 Hz; can often be felt, or sensed as a vibration and can induce motion sickness and other disturbances, and even kill
5. heat exchanger e. is a type of light wave; people cannot see it because it is just outside the range of light which human eyes can detect
6. infra-red f. the physical elements and interfaces that constitute a component or system
7. infrasound g. storage medium that stores data in form of magnetic patterns on a rigid disk. Modern hard disks are usually made of several thin films deposited on both sides of the aluminium, glass etc.

Electronics

The field of **electronics** is the study and use of systems that operate by controlling the flow of electrons (or other charge carriers) in devices such as thermionic valves and semiconductors. The design and construction of electronic circuits to solve practical problems is part of the field of electronics engineering and includes the hardware design side of computer engineering.

The study of new semiconductor devices and their technology is sometimes considered as a branch of physics. This page focuses on engineering aspects of electronics.

Electronic systems are used to perform a wide variety of tasks. The main uses of electronic circuits are the controlling, processing and distribution of information, and the conversion and distribution of electric power. Both of these uses involve the creation or detection of electromagnetic fields and electric currents. While electrical energy had been used for some time to transmit data over telegraphs and telephones, the development of electronics truly began in earnest with the advent of radio.

One way of looking at an electronic system is to divide it into the following parts:

- Inputs - Electronic or mechanical sensors (or transducers), which take signals from outside sources such as antennae or networks, (or signals which represent values of temperature, pressure, etc.) from the physical world and convert them into current/voltage or digital signals.

- Signal processing circuits - These consist of electronic components connected together to manipulate, interpret and transform the signals. Recently, complex processing has been accomplished with the use of Digital Signal Processors.

- Outputs - Actuators or other devices such as transducers that transform current/voltage signals back into useful physical form.

One example is a television set. Its input is a broadcast signal received by an antenna or fed in through a cable. Signal processing circuits inside the television extract the brightness, colour and sound information from this signal. The output devices are a cathode ray tube that converts electronic signals into a visible image on a screen and magnet driven audio speakers.

Reading and vocabulary:

1. What is the field of electronics?
2. What devices does the field of electronics use?
3. Which are the main uses of electronic circuits?
4. What do these uses involve?
5. Divide the electronic system.
6. What do electronic or mechanical sensors do?
7. What do signal processing circuits do?

Look up and find the meaning of the words:

thermionic
valves
semiconductors
conversion
transducers
to accomplish
actuator

Match the words or the expressions with their definitions:

- | | |
|-------------|--|
| 1. IP | a. abbreviation for Internet Protocol |
| 2. ISP | b. the fastest way to get from one area of an Internet service to another; also used by search engines to find what one is searching for |
| 3. keyboard | c. a light source producing, through simulated emission, coherent, near monochromatic light |
| 4. keyword | d. on most computers, is the primary text input device |
| 5. laser | e. current flowing from input or output to case of an isolated converter at a specific voltage level |

6. leakage

f. abbreviation for Internet Service Provider

Electronic devices and components

An electronic component is any indivisible electronic building block packaged in a discrete form with two or more connecting leads or metallic pads. Components are intended to be connected together, usually by soldering to a printed circuit board, to create an electronic circuit with a particular function (for example an amplifier, radio receiver, or oscillator). Components may be packaged singly (resistor, capacitor, transistor, diode etc.) or in more or less complex groups as integrated circuits (operational amplifier, resistor array, logic gate etc). Active components are sometimes called devices rather than components.

Most analog electronic appliances, such as radio receivers, are constructed from combinations of a few types of basic circuits. Analog circuits use a continuous range of voltage as opposed to discrete levels as in digital circuits. The number of different analogue circuits so far devised is huge, especially because a “circuit” can be defined as anything from a single component, to systems containing thousands of components.

Analog circuits are sometimes called linear circuits although many non-linear effects are used in analog circuits such as mixers, modulators etc. Good examples of analog circuits are valve or transistor amplifiers, operational amplifiers and oscillators.

Some analog circuitry these days may use digital or even microprocessor techniques to improve upon the basic performance of the circuit. This type of circuits is usually called “mixed signal”.

Sometimes it may be difficult to differentiate between analogue and digital circuits as they have elements of both linear and non-linear operation. An example is the comparator that takes in a continuous range of voltage but puts out only one of two levels as in a digital circuit. Similarly, a transistor amplifier overdriven can take on the characteristics of a controlled switch having substantially only two levels of output.

Digital circuits are electric circuits based on a number of discrete voltage levels. Digital circuits are the most common mechanical representation of Boolean algebra and are the basis of all digital computers. To most engineers, the terms “digital circuit”, “digital system” and “logic” are interchangeable in the context of digital circuits. In most cases

the number of different states of a node is two, represented by two voltage levels labelled “Low” and “High”. Often “Low” will be near zero volts and “High” will be at a higher level depending on the supply voltage in use.

Computers, electronic clocks, and programmable logic controllers (used to control industrial processes) are constructed of digital circuits; Digital Signal Processors are another example.

Mixed-signal circuits refers to integrated circuits (ICs) which have both analog circuits and digital circuits combined on a single semiconductor die or on the same circuit board. Mixed-signal circuits are becoming increasingly common. Mixed circuits contain both analogue and digital components. Analog to digital converters and digital to analogue converters are the primary examples. Other examples are transmission gates and buffers.

Reading and vocabulary:

1. What is an electronic component?
2. How may the components be packaged?
3. What is an analog circuit? How is it called?
4. What may an analog circuitry use to improve the performance of the circuit?
5. What is a digital circuit?
6. What do “Low” and “High” mean?
7. What is a mixed-signal circuit?

Look up and find the meaning of the words:

soldering	buffer
appliance	analog circuit
overdrive	digital circuit
interchangeable	mixed-signal circuit
transmission gate	

Match the words or the expressions with their definitions:

1. microchip a. the brain of a robot
2. b. the PC board of a computer that

microphone	contains the bus lines and edge connectors to accommodate other boards in the system
3. microprocessor	c. another term for a computer display screen
4. monitor	d. a pointing device that looks like a small box with a ball underneath it and a cable attaching it to the computer
5. motherboard	e. a unit of measurement equal to one billionth of a meter; equal to 10^{-9} meter or 10^{-6} mm or 10^{-3} micrometer or 10 angstrom
6. mouse	f. the application of science to develop new materials and processes by manipulating molecular and atomic particles
7. nanometer	g. converts sound waves to electrical signal
8. nanotechnology	h. a set of computers linked one to another for resources and data sharing
9. network	i. the mode in which a network control program can direct a communication controller to perform such activities as pooling, device addressing, dialling and answering
10. network architecture	j. a compact element of a computer central processing unit, constructed as a single integrated unit and increasingly used as a control unit for robots
11. network control mode	k. the logical structure and operating principles (related to services, functions and protocols) of a computer network

Electromechanics

In engineering, electromechanics combines the sciences of electromagnetism of electrical engineering and mechanics. Mechatronics is the discipline of engineering that combines mechanics, electronics and information technology.

Electromechanical devices are those that combine electrical and mechanical parts. These include electric motors and mechanical devices powered by them, such as calculators and adding machines, switches, solenoids, relays, crossbar switches and stepping switches.

Early on, “**repeaters**” originated with telegraphy and were electromechanical devices used to regenerate telegraph signals. The telephony crossbar switch is an electromechanical device for switching telephone calls. They were first widely installed in the 1950s in both the United States and England, and from there quickly spread to the rest of the world. They replaced earlier designs like the Strowger switch in larger installations. Nikola Tesla, one of the great engineers, pioneered the field of electromechanics.

Paul Nipkow proposed and patented the first electromechanical television system in 1885. Electrical typewriters developed, up to the 1980s, as “power-assisted typewriters”. They contained a single electrical component in them, the motor.

At Bell Labs, in the 1940s, the Bell Model V computer was developed. It was an electromechanical relay-based monster with cycle times in seconds. In 1968 Garrett Systems were invited to produce a digital computer to compete with electromechanical systems then under development for the main flight control computer in the US Navy’s new F-14 Tomcat fighter.

Today, though, common items which would have used electromechanical devices for control, today use, less expensive and more effectively, a standard integrated circuit (containing a few million transistors) and write a computer program to carry out the same task through logic. Transistors have replaced almost all electromechanical devices, are used in most simple feedback control systems, and appear in huge numbers in everything from traffic lights to washing machines.

Reading and vocabulary:

1. What is Electromechanics?
2. What is Mechatronics?
3. What are electromechanical devices?
4. What are "repeaters"?
5. When the telephony crossbar switch was first installed?
6. How were the electrical typewriters?
7. Which devices replaced the electromechanical devices?

Look up and find the meaning of the words:

electromechanics	relays
mechatronics	crossbar switches
electromagnetism	stepping switches
switches	typewriter
solenoids	

Match the words or the expressions with their definitions:

- | | |
|----------------|--|
| 1. overcurrent | a. any current in excess of a rated current of a drive to maintain or move to a new position at a given velocity and acceleration and deceleration rate |
| 2. overhead | b. the condition where more load is applied to the transducer that can measure; this will result in saturation |
| 3. overload | c. a hand-held computer |
| 4. palm | d. a variable that is given a constant value for a specified application and that may denote the application |
| 5. panel | e. extra processing time required prior to the execution of a command or extra space required for non-data information such as location and timing; disk overhead occupies up to ten percent of drive capacity |

6. parameter f. for computer or network security, a specific string of characters entered by a user and authenticated by the system in determining the user's privileges - if any - to access and manipulate the data and operations of the system
7. password g. a line or a list of items waiting to be processed
8. queue h. a formatted display of information that appears on a display screen

Environment

An **environment** is a complex of surrounding circumstances, conditions, or influences in which a thing is situated or is developed, or in which a person or organism lives, modifying and determining its life or character.

In biology, ecology, and environmental science, an **environment** is the complex of physical, chemical, and biotic factors that surround and act upon an organism or ecosystem. The natural environment is such an environment that is relatively unaffected by human activity.

Environmentalism is a concern that deals with the preservation of the natural environment, especially from human pollution, and the ethics and politics associated with this.

In social science, **environmentalism** is the theory that the general and social environment is the primary influence on the development of a person or group. See also nature versus nurture.

Another social science concept is the **Social environment**, also known as **milieu**.

In computing, an **environment** is the overall system, software, or interface in which a program runs, such as a runtime environment or environment variable, or through which a user operates the system, such as an integrated development environment in which the user develops software or a desktop environment.

In art, an **environment** is a kind of installation, an artwork that surrounds the observer, and sometimes allows the audience to modify it or interact with it. The first environment was probably the installation of wool strings and playing children by Marcel Duchamp in a group exhibition around 1945.

Reading and vocabulary:

1. What is an environment?
2. What is an environment in biology, ecology, and environmental science?
3. What is an environment in computing?
4. What is an environment in art?

5. What is a milieu?
6. What is Environmentalism?
7. What is Environmentalism in social science?
8. How important do you think it is to preserve the natural environment?

Look up and find the meaning of the words:

deforestation
landfill
waste disposal
overfertilization
unleaded petrol / gas
packaging
endangered
global warming
No tipping
dumping

Match the words or the expressions with their definitions:

- | | |
|--|---|
| 1. Queue | a. A line or a list of items waiting to be processed |
| 2. RAM
(Random
Access
Memory) | b. Is a section of memory that is permanent and will not be lost when the computer is turned off; the computer's start-up instructions are stored |
| 3. ROM (Read
Only Memory) | c. The command given to execute a program or instruction |
| 4. Run | d. Abbreviation for Random Access Memory; the working memory of the computer into which application programs can be loaded and executed |

Power stations

A **power station** or **power plant** is a facility for the generation of electric power. "Power plant" is also used to refer to the engine in ships, aircraft and other large vehicles. Some prefer to use the term energy centre because it more accurately describes what the plants do, which is the conversion of other forms of energy, like chemical energy, into electrical energy. However, power plant is the most common term in the U.S., while elsewhere power station and power plant are both widely used, power station prevailing in the Commonwealth and especially in Britain.

At the centre of nearly all power stations is a generator, a rotating machine that converts mechanical energy into electrical energy by creating relative motion between a magnetic field and a conductor. The energy source harnessed to turn the generator varies widely. It depends chiefly on what fuels are easily available and the types of technology that the power company has access to.

Thermal power stations

In thermal power stations, mechanical power is produced by a heat engine, which transforms thermal energy, often from combustion of a fuel, into rotational energy. Most thermal power plants produce steam, and these are sometimes called steam power plants. Not all thermal energy can be transformed to mechanical power, according to the second law of thermodynamics. Therefore, thermal power plants also produce low-temperature heat. If no use is found for the heat, it is lost to the environment. If reject heat is employed as useful heat, for industrial processes or district heating, the power plant is referred to as a cogeneration power plant or CHP (combined heat-and-power) plant. In countries where district heating is common, there are dedicated heat plants called heat-only boiler stations. An important class of power stations in the Middle East uses by-product heat for desalination of water.

Classification

Thermal power plants are classified by the type of fuel and the type of prime mover installed.

By fuel

Nuclear power plants use a nuclear reactor's heat to operate a steam turbine generator.

Fossil fuel powered plants may also use a steam turbine generator or in the case of Natural gas fired plants may use a combustion turbine.

Geothermal power plants use steam extracted from hot underground rocks.

Renewable energy plants may be fuelled by waste from sugar cane, municipal solid waste, landfill methane, or other forms of biomass.

In integrated steel mills, blast furnace exhaust gas is a low-cost, although low-energy-density, fuel.

Waste heat from industrial processes is occasionally concentrated enough to use for power generation, usually in a steam boiler and turbine.

By prime mover

Steam turbine plants use the pressure generated by expanding steam to turn the blades of a turbine.

Gas turbine plants use the heat from gases to directly operate the turbine. Natural-gas fuelled turbine plants can start rapidly and so are used to supply “peak” energy during periods of high demand, though at higher cost than base-loaded plants.

Combined cycle plants have both a gas turbine fired by natural gas, and a steam boiler and steam turbine which use the exhaust gas from the gas turbine to produce electricity. This greatly increases the overall efficiency of the plant, and most new base load power plants are combined cycle plants fired by natural gas.

Internal combustion Reciprocating engines are used to provide power for isolated communities and are frequently used for small cogeneration plants. Hospitals, office buildings, industrial plants, and other critical facilities also use them to provide backup power in case of a power outage. These are usually fuelled by diesel oil, heavy oil, natural gas and landfill gas.

Micro turbines, Stirling engine and internal combustion reciprocating engines are low cost solutions for using opportunity fuels, such as landfill gas, digester gas from water treatment plants and waste gas from oil production.

Cooling towers and waste heat

Because of the fundamental limits to thermodynamic efficiency of any heat engine, all thermal power plants produce waste heat as a by-product of the useful electrical energy

produced. Natural draft wet cooling towers at nuclear power plants and at some large thermal power plants are large hyperbolic chimney-like structures that release the waste heat to the ambient atmosphere by the evaporation of water.

However, the mechanical induced-draft or forced-draft wet cooling towers in many large thermal power plants, petroleum refineries, petrochemical plants, geothermal, biomass and waste to energy plants use fans to provide air movement upward through down coming water and are not hyperbolic chimney-like structures. The induced or forced-draft cooling towers are rectangular, box-like structures filled with a material that enhances the contacting of the up flowing air and the down flowing water.

In desert areas a dry cooling tower or radiator may be necessary, since the cost of make-up water for evaporative cooling would be prohibitive. These have lower efficiency and higher energy consumption in fans than a wet, evaporative cooling tower.

Where it is economically, and environmentally possible, electric companies prefer to use cooling water from the ocean, or a lake or river, or a cooling pond, instead of a cooling tower. This type of cooling can save the cost of a cooling tower and may have lower energy costs for pumping cooling water through the plant's heat exchangers. However, the waste heat can cause the temperature of the water to rise detectably. Power plants using natural bodies of water for cooling must be designed to prevent intake of organisms into the cooling cycle. A further environmental impact would be organisms that adapt to the warmer temperature of water when the plant is operating that may be injured if the plant shuts down in cold weather.

Reading and vocabulary:

1. What is a power station or a power plant?
2. How is mechanical power produced in thermal power stations?
3. Which is the classification of thermal power plants?
4. What is a nuclear power plant?
5. What is a fossil fuel powered plant?
6. What is a geothermal power plant?

7. What is a renewable energy plant?
8. What do steam turbine plants use?
9. What about gas turbine plants and combined cycle plants?
10. Why are power plants so important for the industry?

Look up and find the meaning of the words and the expressions:

commonwealth
harness
cogeneration
desalination
reciprocating engines
forced-draft cooling towers
induced-draft
prime mover
by-product heat

Match the words or the expressions with their definitions:

- | | |
|-----------------|--|
| 1. sample | a. a device or devices randomly chosen from a lot of material. Sampling assumes that randomly selected devices will exhibit characteristics during testing that are typical of the lot as a whole |
| 2. scaling | b. a hardware device that is the central point, or one of them, for a network, a unit that provides services, share its resources and information with other computers, called clients, on a network |
| 3. server | c. the process of ending operation of a system or a subsystem, following a defined procedure |
| 4. shutdown | d. the name given to any telecommunications system involving the transmission of speech information, allowing two or more persons to communicate verbally |
| 5. solvency | e. a box into which a computer user can type text, usually in a word processor, within a formatting procedure or a graphic |
| 6. telephony | f. an operation performed by a digital processor to fill the screen with an image not being displayed in the native resolution of the LCD panel |
| 7. text box | g. an insidious and usually illegal computer program that masquerades as a program that is useful, fun or otherwise desirable for users to download to their system. Once the program is downloaded, it performs a destructive act |
| 8. trojan horse | h. abbreviation for Uninterruptible Power Supply, a standby power source that provides power to a server or other devices from a battery in the event of normal AC power failure |

9. UPS

i. ability of a fluid to dissolve inorganic materials and polymers

Optical fiber communications

Optical fiber communication is the method of transmitting information through optical fibers. Optical fibers can be used to transmit light and thus information over long distances. Nowadays, fiber-based systems have largely replaced radio transmitter systems for long-haul optical data transmission. They are largely used for telephony, but also for Internet traffic, long high-speed local area networks (LANs), cable-TV, and increasingly also for shorter distances.

Compared to systems based on electrical cables, the approach of optical fiber communications has advantages, the most important of which are:

The capacity of fibers for data transmission is huge: a single fiber can carry hundreds of thousands of telephone channels even without nearly utilizing the full theoretical capacity. In the last 30 years, the progress concerning transmission capacities of fiber links has been significantly faster than e.g. the progress in the speed or storage capacity of computers.

The losses for light propagating in fibers are amazingly small: about 0.2 dB/km for modern single-mode fibers, so that many tens of kilometres can be bridged without amplifying the signals.

A large number of channels can be reamplified in a single fiber amplifier, if required for very large transmission distances.

Due to the achievable huge transmission rate, the cost per transported bit can be extremely low.

Compared to electrical cables, fiber-optic cables are very lightweight, so that the cost of laying a fiber-optic cable is much lower.

Fiber-optic cables are immune to problems of electrical cables such as ground loops or electromagnetic interference (EMI).

However, fiber systems are somewhat more sophisticated to install and operate, so that they tend to be less economical if their full transmission capacity is not required. Therefore, the "last mile" (the connection to the homes and offices) and usually still bridged with electrical cables, while fiber-based communications do the bulk of the long-haul transmission. Gradually, however, fiber communications are used within

metropolitan areas, and currently we see even the beginning of fiber to the home (FTTH), particularly in Japan, where private Internet users can already obtain affordable Internet connections with data rates of 100 Mbit/s – well above the performance of current ADSL systems, which use electrical telephone lines.

Optical fiber communications typically operate in a wavelength region corresponding to one of the following “telecom windows”:

The first window at 800-900 nm was originally used. GaAs / AlGaAs-based laser diodes and light-emitting diodes (LEDs) served as senders, and silicon photodiodes were suitable for the receivers. However, the fiber losses are relatively high in this region, and fiber amplifiers are not well developed for this spectral region. Therefore, the first telecom window is suitable only for short-distance transmission.

The second telecom window utilizes wavelengths around 1.3 μm , where the fiber loss is much lower and the fiber dispersion is very small, so that dispersive broadening is minimized. This window was originally used for long-haul transmission. However, fiber amplifiers for 1.3 μm are not as good as their 1.5- μm counterparts based on erbium, and zero dispersion is not necessarily ideal for long-haul transmission, as it can increase the effect of optical nonlinearities.

The third telecom window, which is now very widely used, utilizes wavelengths around 1.5 μm . The fiber losses are lowest in this region, and erbium-doped fiber amplifiers are available which offer very high performance. Fiber dispersion is usually anomalous but can be tailored with great flexibility (dispersion-shifted fibers).

Reading and vocabulary:

1. What is optical fiber communication?
2. How can optical fibers be used?
3. Which are the advantages of fiber communications?
4. What are Telecom Windows?
5. Which are the characteristics of the first window?
6. What about the second and the third window?
7. Why is optical fiber communication so important?

Look up and find the meaning of the words and the expressions:

optical fiber
long-haul optical data
bulk
wavelength
broadening
counterparts
erbium
erbium-doped fiber
dispersion-shifted fiber

Match the words or the expressions with their definitions:

- | | |
|--------------------|---|
| 1. virtual address | a. the address of a location in virtual storage; a virtual address must be translated into a real address in order to process the data in processor storage |
| 2. wireless | b. a lens with variable focal length providing the ability to adjust the size on a screen by adjusting the zoom lens, instead of having to move the projector closer or further |
| 3. wizard | c. in a user interface, to progressively increase or decrease the size of a part of an image on a screen or in a window |
| 4. workstation | d. an insidious and usually illegal computer program that it designed to replicate itself over a network for the purpose of causing harm and / or destruction. |
| 5. worm | e. a dialog within an application that uses step-by-step instructions to guide a user through a specific task |
| 6. zoom | f. the term refers to telecommunication in which electromagnetic waves, such as radio or television, to carry any communications signal |

from one section of a communications path to another

- 7. zoom lens g. a computer, usually used on a network or a scientific computer used for scientific application
- 8. cable assembly h. a designated memory holding area that temporarily stores information copied or cut from a document, or files for transfer
- 9. clipboard i. fiber optic cable that has connectors installed on one or both ends
- 10. cluster j. a group of sectors on a hard drive that is addressed as one logical unit by the operating system. It is also the smallest contiguous area that can be allocated for the storage of data even if actual data require less storage

Other sources of energy

Other power stations use the energy from wave or tidal motion, wind, sunlight or the energy of falling water, hydroelectricity. These types of energy sources are called renewable energy.

Hydroelectricity: Hydroelectric dams impound a reservoir of water and release it through one or more water turbines to generate electricity.

Pumped storage: A pumped storage hydroelectric power plant is a net consumer of energy but decreases the price of electricity. Water is pumped to a high reservoir during the night when the demand, and price, for electricity is low. During hours of peak demand, when the price of electricity is high, the stored water is released to produce electric power. Some pumped storage plants are actually not net consumers of electricity because they release some of the water from the lower reservoir downstream, either continuously or in bursts.

Solar power: A solar photovoltaic power plant converts sunlight directly into electrical energy, which may need conversion to alternating current for transmission to users. This type of plant does not use rotating machines for energy conversion. Solar thermal electric plants are another type of solar power plant. They direct sunlight using either parabolic troughs or heliostats. Parabolic troughs direct sunlight onto a pipe containing a heat transfer fluid, such as oil, which is then used to boil water, which turns the generator. The central tower type of power plant uses hundreds or thousands of mirrors, depending on size, to direct sunlight onto a receiver on top of a tower. Again, the heat is used to produce steam to turn turbines. There is yet another type of solar thermal electric plant. The sunlight strikes the bottom of the pond, warming the lowest layer which is prevented from rising by a salt gradient. A Rankine cycle engine exploits the temperature difference in the layers to produce electricity. Not many solar thermal electric plants have been built. Most of them can be found in the Mojave Desert, although Sandia National Laboratory, Israel and Spain have also built a few plants.

Wind power: Wind turbines can be used to generate electricity in areas with strong, steady winds. Many different designs have been used in the past, but almost all modern turbines being produced today use the Dutch three-bladed,

upwind design. Grid-connected wind turbines now being built are much larger than the units installed during the 1970's, and so produce power more cheaply and reliably than earlier models. With larger turbines (greater than 100 kW), the blades move more slowly than older, smaller (less than 100 kW) units, which makes them less visually distracting and safer for airborne animals. However, the old turbines can still be seen at some wind farms, particularly at Altamont Pass and Tehachapi Pass.

Nuclear power plant: A nuclear power station: The nuclear reactor is contained inside the cylindrical containment buildings to the right - left is a cooling tower venting water vapour from the Non-Radioactive side of the plant.

A nuclear power plant (NPP) is a thermal power station in which the heat source is one or more nuclear reactors generating nuclear power.

Nuclear power plants are base load stations, which work best when the power output is constant (although boiling water reactors can come down to half power at night). Their units' range in power from about 40 MWe to over 1000 MWe. New units under construction in 2005 are typically in the range 600-1200 MWe.

As of 2005 there are 443 licensed nuclear power reactors in the world, of which 441 are currently operational operating in 31 different countries. Together they produce about 17% of the world's electric power.

Electricity was generated for the first time by a nuclear reactor on December 20, 1951 at the EBR-I experimental station near Arco, Idaho in the United States. On June 27, 1954, the world's first nuclear power plant to generate electricity for a power grid started operations at Obninsk, USSR. The world's first commercial scale power station, Calder Hall in England opened in 17 October, 1956.

Reading and vocabulary:

1. What is Hydroelectricity?
2. What does pumped storage mean?
3. A photovoltaic power plant is....
4. What are wind turbines?
5. Explain how a nuclear power plant works.

Look up and find the meaning of the words and the expressions:

nuclear reactor
grid-connected wind turbines
hours of peak demand
tidal motion
hydro-energy
hydroelectric dams
load stations
boiling water reactors

Types of nuclear power plants

Nuclear power plants are classified according to the type of reactor used. However some installations have several independent units and these may use different classes of reactor. In addition, some of the plant-types below in the future may have passively safe features.

Fission reactors: Fission power reactors generate heat by nuclear fission of fissile isotopes of uranium and plutonium.

They may be further divided into three classes:

Thermal reactors use a neutron moderator to slow or moderate neutrons so that they are more likely to produce fission. Neutrons created by fission are high energy, or fast, and must have their energy decreased (be made thermal) by the moderator in order to efficiently maintain the chain reaction.

Fast reactors sustain the chain reaction without needing a neutron moderator. Because they use different fuel than thermal reactors, the neutrons in a fast reactor do not need to be moderated for an efficient chain reaction to occur.

Sub-critical reactors use an outside source of neutrons rather than a chain reaction to produce fission.

Fast reactors: Although some of the earliest nuclear power reactors were fast reactors, they have not as a class achieved the success of thermal reactors. Fast reactors have the advantages that their fuel cycle can use all of the uranium in natural uranium, and also transmute the longer-lived radioisotopes in their waste to faster-decaying materials. For these reasons they are inherently more sustainable as an energy source than thermal reactors. See fast breeder reactor. Because most fast reactors have historically been used for plutonium production, they are associated with nuclear proliferation concerns.

Fusion reactors: Nuclear fusion offers the possibility of the release of very large amounts of energy with a minimal production of radioactive waste and improved safety. However, there remain considerable scientific, technical, and economic obstacles to the generation of commercial electric power using nuclear fusion. It is therefore an active area of research, with

very large-scale facilities such as JET, ITER, and the Z machine.

Advantages of nuclear power plants against other mainstream energy resources are: - no greenhouse gas emissions (during normal operation) - greenhouse gases are emitted only when the Emergency Diesel Generators are tested (the processes of uranium mining and of building and decommissioning power stations produce relatively small amounts); - does not pollute the air - zero production of dangerous and polluting gases such as carbon monoxide, sulphur dioxide, aerosols, mercury, nitrogen oxides, particulates or photochemical smog; - small solid waste generation (during normal operation); low fuel costs - because so little fuel is needed; - large fuel reserves - again, because so little fuel is needed; - nuclear batteries.

However, the disadvantages include: - risk of major accidents; - nuclear waste - high level radioactive waste produced can remain dangerous for thousands of years; - can help produce bombs; high initial costs; - high maintenance costs; - security concerns; high cost of decommissioning plants.

Reading and vocabulary:

How can we classify nuclear power plants?

What are fission reactors?

What is a thermal reactor?

Give the meaning of fast reactors.

What is a fusion reactor?

Look up and find the meaning of the words and the expressions:

Neutrons

thermal reactors

Sub-critical reactors

Nuclear fusion

radioactive waste

photochemical smog

radioisotopes

faster-decaying materials

Telecommunication

Telecommunication is the transmission of signals over a distance for the purpose of communication. Today this process almost always involves the sending of electromagnetic waves by electronic transmitters but in earlier years it may have involved the use of smoke signals, drums or semaphores. Today, telecommunication is widespread and devices that assist the process such as the television, radio and telephone are common in many parts of the world. There is also a vast array of networks that connect these devices, including computer networks, public telephone networks, radio networks and television networks. Computer communication across the Internet, such as e-mail and internet faxing, is just one of many examples of telecommunication.

The word telecommunication was adapted from the French word télécommunication. It is a compound of the Greek prefix tele- (τηλε-), meaning “far off”, and communication, meaning “exchange of information”.

The basic elements of a telecommunication system are:

- a transmitter that takes information and converts it to a signal for transmission
- a transmission medium over which the signal is transmitted
- a receiver that receives and converts the signal back into usable information

For example, consider a radio broadcast. In this case, the broadcast tower is the transmitter, the radio is the receiver and the transmission medium is free space. Often telecommunication systems are two-way and devices act as both a transmitter and receiver or transceiver. For example, a mobile phone is a transceiver. Telecommunication over a phone line is called point-to-point communication because it is between one transmitter and one receiver; telecommunication through radio broadcasts is called broadcast communication because it is between one powerful transmitter and numerous receivers.

Signals can either be analogue or digital. In an analogue signal, the signal is varied continuously with respect to the information. In a digital signal, the information is encoded as a set of discrete values.

A collection of transmitters, receivers or transceivers that communicate with each other is known as a network. Digital networks may consist of one or more routers that route data to the correct user. An analogue network may consist of one or more switches that establish a connection between two or more users. For both types of network, a repeater may be necessary to amplify or recreate the signal when it is being transmitted over long distances. This is to combat noise which can corrupt the information carried by a signal.

A channel is a division in a transmission medium so that it can be used to send multiple independent streams of data. For example, a radio station may broadcast at 96 MHz while another radio station may broadcast at 94.5 MHz. In this case the medium has been divided by frequency and each channel received a separate frequency to broadcast on. Alternatively, one could allocate each channel a segment of time over which to broadcast.

The shaping of a signal to convey information is known as modulation. Modulation is a key concept in telecommunications and is frequently used to impose the information of one signal on another. Modulation is used to represent a digital message as an analogue waveform. This is known as keying and several keying techniques exist - these include phase-shift keying, amplitude-shift keying and minimum-shift keying. Bluetooth, for example, uses phase-shift keying for exchanges between devices.

However, more relevant to earlier discussion, modulation is also used to boost the frequency of analogue signals. This is because a raw signal is often not suitable for transmission over free space due to its low frequencies. Hence its information must be superimposed on a higher frequency signal (known as a carrier wave) before transmission.

Reading and vocabulary:

Give the origin of the word telecommunication.

What is telecommunication?

What is a transmitter ?

What is a receiver?

How can you define the radio broadcast?

Give the meaning of signal.

What is a digital network and an analogue network?

How can you define modulation?

Look up and find the meaning of the words and the expressions:

e-mail

internet faxing

transmission medium

transmitter

receiver

transceiver

broadcast

analogue waveform

minimum-shift keying

phase-shift keying

Early telecommunications

Early forms of telecommunication include smoke signals and drums. Drums were used by natives in Africa, New Guinea and tropical America whereas smoke signals were used by natives in America and China. Contrary to what one might think, these systems were often used to do more than merely announce the presence of a camp.

In 1792, a French engineer, Claude Chappe built the first visual telegraphy (or semaphore) system between Lille and Paris. This was followed by a line from Strasbourg to Paris. In 1794, a Swedish engineer, Abraham Edelcrantz built a quite different system from Stockholm to Drottningholm. As opposed to Chappe's system which involved pulleys rotating beams of wood, Edelcrantz's system relied only upon shutters and was therefore faster. However, semaphore as a communication system suffered from the need for skilled operators and expensive towers often at intervals of only ten to thirty kilometres (six to nineteen miles). As a result, the last commercial line was abandoned in 1880.

Telegraph and telephone

The first commercial electrical telegraph was constructed by Sir Charles Wheatstone and Sir William Fothergill Cooke. It used the deflection of needles to represent messages and started operating over thirteen miles (twenty-one kilometres) of the Great Western Railway on 9 April 1839. Both Wheatstone and Cooke viewed their device as "an improvement to the (existing) electromagnetic telegraph" not as a new device.

On the other side of the Atlantic Ocean, Samuel Morse independently developed a version of the electrical telegraph that he unsuccessfully demonstrated on 2 September 1837. Soon after he was joined by Alfred Vail who developed the register - a telegraph terminal that integrated a logging device for recording messages to paper tape. This was demonstrated successfully over three miles (five kilometres) on 6 January 1838 and eventually over forty miles (64 kilometres) between Washington, DC and Baltimore on 24 May 1844. The patented invention proved lucrative and by 1851 telegraph lines in the United States spanned over 20,000 miles (32,000 kilometres).

The first transatlantic telegraph cable was successfully completed on 27 July 1866, allowing transatlantic telegraph communications for the first time. Earlier transatlantic cables installed in 1857 and 1858 only operated for a few days or weeks before they failed.

The conventional telephone was invented by Alexander Bell in 1876. Although in 1849 Antonio Meucci invented a device that allowed the electrical transmission of voice over a line. Meucci's device depended upon the electrophonic effect and was of little practical value because it required users to place the receiver in their mouth to "hear" what was being said.

The first commercial telephone services were set-up in 1878 and 1879 on both sides of the Atlantic in the cities of New Haven and London. Bell held patents needed for such services in both countries. The technology grew quickly from this point, with inter-city lines being built and exchanges in every major city of the United States by the mid- 1880's. Despite this, transatlantic communication remained impossible for customers until January 7, 1927 when a connection was established using radio. However, no cable connection existed until TAT-1 was inaugurated on September 25, 1956 providing 36 telephone circuits.

Reading and vocabulary:

Give example of early forms of telecommunication.

Who was Claude Chappe?

What is an electrical telegraph?

Who was Samuel Morse?

When was completed the first transatlantic telegraph cable?

When was invented the conventional telephone?

When were the first commercial telephone services set-up?

Look up and find the meaning of the words and the expressions:

smoke signals and drums

visual telegraphy

rotating beams of wood

semaphore

inter-city lines

electrical telegraph
telegraph cable

Radio and television 1

In 1832, James Lindsay gave a classroom demonstration of wireless telegraphy to his students. By 1854 he was able to demonstrate a transmission across the Firth of Tay from Dundee to Woodhaven, a distance of two miles, using water as the transmission medium.

Addressing the Franklin Institute in 1893, Nikola Tesla described and demonstrated in detail the principles of wireless telegraphy. The apparatus that he used contained all the elements that were incorporated into radio systems before the development of the vacuum tube. However, it was not until 1900, that Reginald Fessenden was able to wirelessly transmit a human voice. In December 1901, Guglielmo Marconi established wireless communication between Britain and the United States earning him the Nobel Prize in physics in 1909 (which he shared with Karl Braun).

On March 25, 1925, John Logie Baird was able to demonstrate the transmission of moving pictures at the London department store Selfridges. However his device did not adequately display halftones and thus only presented a silhouette of the recorded image. This problem was rectified in October of that year leading to a public demonstration of the improved device on 26 January 1926 again at Selfridges. Baird's device relied upon the Nipkow disk and thus became known as the mechanical television. It formed the basis of experimental broadcasts done by the British Broadcasting Corporation beginning September 30, 1929.

However for most of the twentieth century televisions depended upon the cathode ray tube invented by Karl Braun. The first version of such a television to show promise was produced by Philo Farnsworth and demonstrated to his family on September 7, 1927. Farnsworth's device would compete with the work of Vladimir Zworykin who also produced a television picture in 1929 on a cathode ray tube. Zworykin's camera, which later would be known as the Iconoscope, had the backing of the influential Radio Corporation of America (RCA) however eventually court action regarding "the electron image" between Farnsworth and RCA would resolve in Farnsworth's favour.

Radio and television 2

The broadcast media industry is also at a critical turning point in its development, with many countries starting to move from analogue to digital broadcasts. The chief advantage of digital broadcasts is that they prevent a number of complaints with traditional analogue broadcasts. For television, this includes the elimination of problems such as snowy pictures, ghosting and other distortion. These occur because of the nature of analogue transmission, which means that perturbations due to noise will be evident in the final output. Digital transmission overcomes this problem because digital signals are reduced to binary data upon reception and hence small perturbations do not affect the final output.

In digital television broadcasting, there are three competing standards that are likely to be adopted worldwide. These are the ATSC, DVB and ISDB standards and the adoption of these standards thus far is presented in the captioned map. All three standards use MPEG-2 for video compression. ATSC uses Dolby Digital AC-3 for audio compression, ISDB uses Advanced Audio Coding (MPEG-2 Part 7) and DVB has no standard for audio compression but typically uses MPEG-1 Part 3 Layer 2. The choice of modulation also varies between the schemes. Both DVB and ISDB use orthogonal frequency-division multiplexing (OFDM) for terrestrial broadcasts (as opposed to satellite or cable broadcasts) whereas ATSC uses vestigial sideband modulation (VSB). OFDM should offer better resistance to multi-path interference and the Doppler Effect (which would impact reception using moving receivers). However controversial tests conducted by the United States' National Association of Broadcasters have shown that there is little difference between the two for stationary receivers.

In digital audio broadcasting, standards are much more unified with practically all countries (including Canada) choosing to adopt the Digital Audio Broadcasting standard (also known as the Eureka 147 standard).

However, despite the pending switch to digital, analogue receivers still remain widespread. Analogue television is still transmitted in practically all countries. For analogue, there are three standards in use. These are known as PAL, NTSC and SECAM. The basics of PAL and NTSC are very similar; a quadrature amplitude modulated sub-carrier carrying the chrominance information is added to the luminance video

signal to form a composite video base-band signal (CVBS). The SECAM system, on the other hand, uses a frequency modulation scheme on its colour sub-carrier. The name "Phase Alternating Line" describes the way that the phase of part of the colour information on the video signal is reversed with each line, which automatically corrects phase errors in the transmission of the signal by cancelling them out. For analogue radio, the switch to digital is made more difficult by the fact that analogue receivers cost a fraction of the cost of digital receivers.

Reading and vocabulary:

Look up and find the meaning of the words and the expressions:

Telephone

Today, the fixed-line telephone systems in most residential homes remain analogue and, although short-distance calls may be handled from end-to-end as analogue signals, increasingly telephone service providers are transparently converting signals to digital before, if necessary, converting them back to analogue for reception. Mobile phones have had a dramatic impact on telephone service providers. Mobile phone subscriptions now outnumber fixed line subscriptions in many markets. Sales of mobile phones in 2005 totalled 816.6 million with that figure being almost equally shared amongst the markets of Asia/Pacific (204m), Western Europe (164m), CEMEA (Central Europe, the Middle East and Africa) (153.5m), North America (148m) and Latin America (102m). In terms of new subscriptions over the five years from 1999, Africa has outpaced other markets with 58.2% growth compared to the next largest market, Asia, which boasted 34.3% growth. Increasingly these phones are being serviced by digital systems such as GSM or W-CDMA with many markets choosing to depreciate analogue systems such as AMPS.

However there have been equally drastic changes in telephone communication behind the scenes. Starting with the operation of TAT-8 in 1988, the 1990s saw the widespread adoption of systems based around optic fibres. The benefit of communicating with optic fibres is that they offer a drastic increase in data capacity. TAT-8 itself was able to carry 10 times as many telephone calls as the last copper cable laid at that time and today's optic fibre cables are able to carry 25 times as many telephone calls as TAT-8. This rapid increase in data capacity is due to several factors. First, optic fibres are physically much smaller than competing technologies. Second, they do not suffer from crosstalk which means several hundred of them can be easily bundled together in a single cable. Lastly, improvements in multiplexing have lead to an exponential growth in the data capacity of a single fibre. This is due to technologies such as dense wavelength-division multiplexing, which at its most basic level is building multiple channels based upon frequency division as discussed in the Technical foundations section. However, despite the advances of technologies such as dense wavelength-division multiplexing, technologies based around building multiple

channels based upon time division such as synchronous optical networking and synchronous digital hierarchy remain dominant.

Assisting communication across these networks is a protocol known as Asynchronous Transfer Mode (ATM). As a technology, ATM arose in the 1980s and was envisioned to be part of the Broadband Integrated Services Digital Network. The network ultimately failed but the technology gave birth to the ATM Forum which in 1992 published its first standard. Today, despite competitors such as Multiprotocol Label Switching, ATM remains the protocol of choice for most major long-distance optical networks. The importance of the ATM protocol was chiefly in its notion of establishing pathways for data through the network and associating a traffic contract with these pathways. The traffic contract was essentially an agreement between the client and the network about how the network was to handle the data. This was important because telephone calls could negotiate a contract to guarantee themselves a constant bit rate, something that was essential to ensure the call could take place without a caller's voice being delayed in parts or cut-off completely.

Reading and vocabulary:

Look up and find the meaning of the words and the expressions:

Computer networks

On September 11, 1940 George Stibitz was able to transmit problems using teletype to his Complex Number Calculator in New York and receive the computed results back at Dartmouth College in New Hampshire. This configuration of a centralized computer or mainframe with remote dumb terminals remained popular throughout the 1950s. However, it was not until the 1960s that researchers started to investigate packet switching – a technology that would allow chunks of data to be sent to different computers without passing through a centralized mainframe, first. A four - node network emerged on December 5, 1969 between the University of California, Los Angeles, the Stanford Research Institute, the University of Utah and the University of California, Santa Barbara. This network would become ARPANET, which by 1981 would consist of 213 nodes. In June 1973, the first non-US node was added to the network belonging to Norway's NORSAR project. This was shortly followed by a node in London.

The Internet

Today an estimated 15.7% of the world population has access to the Internet with the highest concentration in North America (68.6%), Oceania/Australia (52.6%) and Europe (36.1%). In terms of broadband access, countries such as Iceland (26.7 per 100), South Korea (25.4 per 100) and the Netherlands (25.3 per 100) lead the world. The International Telecommunication Union uses this information to compile a Digital Access Index that measures the overall ability of citizens to access and use information and communication technologies. Using this measure, countries such as Sweden, Denmark and Iceland receive the highest ranking while African countries such as Niger, Burkina Faso and Mali receive the lowest.

The history of the Internet dates back to the early development of communication networks. The idea of a computer network intended to allow general communication between users of various computers has developed through a large number of stages. The melting pot of developments brought together the network of networks that we know as the Internet. This included both technological developments and

the merging together of existing network infrastructure and telecommunication systems.

The earliest versions of these ideas appeared in the late 1950s. Practical implementations of the concepts began during the late 1960s and 1970s. By the 1980s, technologies we now recognize as the basis of the modern Internet began to spread over the globe. In the 1990s the introduction of the World Wide Web (WWW) saw its use become commonplace.

The infrastructure of the Internet spread across the globe to create the world wide network of computers we know today. It spread throughout the Western nations and then begged a penetration into the developing countries, thus creating both unprecedented worldwide access to information and communications and a digital divide in access to this new infrastructure. The Internet went on to fundamentally alter and affect the economy of the world, including the economic implications of the dot-com bubble and offshore outsourcing of White-collar workers.

Reading and vocabulary:

Look up and find the meaning of the words and the expressions:

Before the Internet

Prior to the widespread inter-networking that led to the Internet, most communication networks were limited by their nature to only allow communications between the stations on the network. Some networks had gateways or bridges between them, but these bridges were often limited or built specifically for a single use. One prevalent computer networking method was based on the central mainframe method, simply allowing its terminals to be connected via long leased lines. This method was used in the 1950s by Project RAND to support researchers such as Herbert Simon, in Pittsburgh, Pennsylvania, when collaborating across the continent with researchers in Santa Monica, California, on automated theorem proving and artificial intelligence.

Networks that led to the Internet

ARPANET: Promoted to the head of the information processing office at ARPA, Robert Taylor intended to realize Lickliter's ideas of an interconnected networking system. Bringing in Larry Roberts from MIT, he initiated a project to build such a network. The first ARPANET link was established between the University of California, Los Angeles and the Stanford Research Institute on 21 November 1969. By 5 December 1969, a 4-node network was connected by adding the University of Utah and the University of California, Santa Barbara. Building on ideas developed in ALOHA net, the ARPANET started in 1972 and was growing rapidly by 1981. The number of hosts had grown to 213, with a new host being added approximately every twenty days.

ARPANET became the technical core of what would become the Internet, and a primary tool in developing the technologies used. ARPANET development was centred on the Request for Comments (RFC) process, still used today for proposing and distributing Internet Protocols and Systems. RFC 1, entitled "Host Software", was written by Steve Crocker from the University of California, Los Angeles, and published on April 7, 1969.

Reading and vocabulary:

Look up and find the meaning of the words and the expressions:

Internet protocol suite

With so many different network methods, something needed to unify them. Robert E. Kahn of DARPA and ARPANET recruited Vint Cerf of Stanford University to work with him on the problem. By 1973, they had soon worked out a fundamental reformulation, where the differences between network protocols were hidden by using a common internetwork protocol, and instead of the network being responsible for reliability, as in the ARPANET, the hosts became responsible. Cerf credits Hubert Zimmerman and Louis Pouzin (designer of the CYCLADES network) with important work on this design.

With the role of the network reduced to the bare minimum, it became possible to join almost any networks together, no matter what their characteristics were, thereby solving Kahn's initial problem. DARPA agreed to fund development of prototype software, and after several years of work, the first somewhat crude demonstration of what had by then become TCP/IP occurred in July 1977. This new method quickly spread across the networks, and on January 1, 1983, TCP/IP protocols became the only approved protocol on the ARPANET, replacing the earlier NCP protocol.

ARPANET to NSFNet

After the ARPANET had been up and running for several years, ARPA looked for another agency to hand off the network to; ARPA's primary business was funding cutting-edge research and development, not running a communications utility. Eventually, in July 1975, the network had been turned over to the Defence Communications Agency, also part of the Department of Defence. In 1983, the U.S. military portion of the ARPANET was broken off as a separate network, the MILNET.

The networks based around the ARPANET were government funded and therefore restricted to non-commercial uses such as research; unrelated commercial use was strictly forbidden. This initially restricted connections to military sites and universities. During the 1980s, the connections expanded to more educational institutions, and even to a growing number of companies such as Digital Equipment Corporation

and Hewlett-Packard, which were participating in research projects or providing services to those who were.

Another branch of the U.S. government, the National Science Foundation (NSF), became heavily involved in internet research and started development of a successor to ARPANET. In 1984 this resulted in the first Wide Area Network designed specifically to use TCP/IP. This grew into the NSFNet backbone, established in 1986, and intended to connect and provide access to a number of supercomputing centres established by the NSF.

Reading and vocabulary:

Look up and find the meaning of the words and the expressions:

The transition toward an Internet

It was around the time when ARPANET began to merge with NSFNet, which the term Internet originated, with “an internet” meaning any network using TCP/IP. “The Internet” came to mean a global and large network using TCP/IP, which at the time meant NSFNet and ARPANET. Previously “internet” and “internet work” had been used interchangeably, and “internet protocol” had been used to refer to other networking systems such as Xerox Network Services.

As interest in wide spread networking grew and new applications for it arrived, the Internet’s technologies spread throughout the rest of the world. TCP/IP’s network-agnostic approach meant that it was easy to use any existing network infrastructure, such as the IPSS X.25 network, to carry Internet traffic. In 1984, University College London replaced its transatlantic satellite links with TCP/IP over IPSS.

Many sites unable to link directly to the Internet started to create simple gateways to allow transfer of e-mail, at that time the most important application. Sites which only had intermittent connections used UUCP or FidoNet and relied on the gateways between these networks and the Internet. Some gateway services went beyond simple e-mail peering, such as allowing access to FTP sites via UUCP or e-mail.

The first ARPANet connection outside the US was established to NORSAR in Norway in 1973, just ahead of the connection to Great Britain. These links were all converted to TCP/IP in 1982, at the same time as the rest of the Arpanet.

CERN, the European internet, the link to the Pacific and beyond

In 1984 the move in Europe towards more widespread use of TCP/IP started, and CERNET was converted over to using it. The TCP/IP CERNET remained isolated from the rest of the Internet, forming a small internal internet until 1989.

In 1988 Daniel Karrenberg, from CWI in Amsterdam, visited Ben Segal, CERN’s TCP/IP Coordinator; looking for advice about the transition of the European side of the UUCP Usenet network (much of which ran over X.25 links) over to TCP/IP. In 1987, Ben Segal had met with Len Bosack from the then still small company Cisco about TCP/IP routers, and was

able to give Karrenberg advice and forward him on to Cisco for the appropriate hardware. This expanded the European portion of the Internet across the existing UUCP networks, and in 1989 CERN opened its first external TCP/IP connections. This coincided with the creation of Réseaux IP Européens (RIPE), initially a group of IP network administrators who met regularly to carry out co-ordination work together. Later, in 1992, RIPE was formally registered as a cooperative in Amsterdam.

At the same time as the rise of internetworking in Europe, ad-hoc networking to ARPA and in-between Australian colleges formed, based on various technologies such as X.25 and UUCPNet. These were limited in their connection to the global networks, due to the cost of making individual international UUCP dial-up or X.25 connections. In 1989, Australian colleges joined the push towards using IP protocols to unify their networking infrastructures. AARNet was formed in 1989 by the Australian Vice-Chancellors' Committee and provided a dedicated IP based network for Australia.

The Internet began to penetrate Asia in the late 1980s. Japan, which had built the UUCP-based network JUNET in 1984, connected to NSFNet in 1989. It hosted the annual meeting of the Internet Society, INET'92, in Kobe. Singapore developed TECHNET in 1990, and Thailand gained a global Internet connection between Chulalongkorn University and UUNET in 1992.

Reading and vocabulary:

Look up and find the meaning of the words and the expressions:

Opening the network to commerce

The interest in commercial use of the Internet became a hotly debated topic. Although commercial use was forbidden, the exact definition of commercial use could be unclear and subjective. Everyone agreed that one company sending an invoice to another company was clearly commercial use, but anything less was up for debate. UUCPNet and the X.25 IPSS had no such restrictions, which would eventually see the official barring of UUCPNet use of ARPANET and NSFNet connections. Some UUCP links still remained connecting to these networks however, as administrators cast a blind eye to their operation.

During the late 1980s, the first Internet service provider (ISP) companies were formed. Companies like PSINet, UUNET, Netcom, and Portal Software were formed to provide service to the regional research networks and provide alternate network access, UUCP-based email and Usenet News to the public. The first dial-up ISP, world.std.com, opened in 1989.

This caused controversy amongst university users, who were outraged at the idea of non-educational use of their networks. Eventually, it was the commercial Internet service providers who brought prices low enough that junior colleges and other schools could afford to participate in the new arenas of education and research.

By 1990, ARPANET had been overtaken and replaced by newer networking technologies and the project came to a close. In 1994, the NSFNet, now renamed ANSNET (Advanced Networks and Services) and allowing non-profit corporations access, lost its standing as the backbone of the Internet. Both government institutions and competing commercial providers created their own backbones and interconnections. Regional network access points (NAPs) became the primary interconnections between the many networks and the final commercial restrictions ended.

Email and Usenet - The growth of the text forum

E-mail is often called the killer application of the Internet. However, it actually predates the Internet and was a crucial

tool in creating it. E-mail started in 1965 as a way for multiple users of a time-sharing mainframe computer to communicate. Although the history is unclear, among the first systems to have such a facility were SDC's Q32 and MIT's CTSS.

The ARPANET computer network made a large contribution to the evolution of e-mail. There is one report indicating experimental inter-system e-mail transfers on it shortly after ARPANET's creation. In 1971 Ray Tomlinson created what was to become the standard Internet e-mail address format, using the @ sign to separate user names from host names.

A number of protocols were developed to deliver e-mail among groups of time-sharing computers over alternative transmission systems, such as UUCP and IBM's VNET e-mail system. E-mail could be passed this way between a number of networks, including ARPANET, BITNET and NSFNet, as well as to hosts connected directly to other sites via UUCP.

In addition, UUCP allowed the publication of text files that could be read by many others. The News software developed by Steve Daniel and Tom Truscott in 1979 was used to distribute news and bulletin board-like messages. This quickly grew into discussion groups, known as newsgroups, on a wide range of topics. On ARPANET and NSFNet similar discussion groups would form via mailing lists, discussing both technical issues and more culturally focused topics.

Reading and vocabulary:

Look up and find the meaning of the words and the expressions:

A world library - From gopher to the WWW

The first World Wide Web server, currently in the CERN museum, labelled “This machine is a server. DO NOT POWER DOWN!!”

As the Internet grew through the 1980s and early 1990s, many people realized the increasing need to be able to find and organize files and information. Projects such as Gopher, WAIS, and the FTP Archive list attempted to create ways to organize distributed data. Unfortunately, these projects fell short in being able to accommodate all the existing data types and in being able to grow without bottlenecks.

One of the most promising user interface paradigms during this period was hypertext. The technology had been inspired by Vannevar Bush’s “memex” and developed through Ted Nelson’s research on Project Xanadu and Douglas Engelbart’s research on NLS. Many small self-contained hypertext systems had been created before, such as Apple Computer’s HyperCard.

In 1991, Tim Berners-Lee was the first to develop a network-based implementation of the hypertext concept. This was after Berners-Lee had repeatedly proposed his idea to the hypertext and Internet communities at various conferences to no avail - no one would implement it for him. Working at CERN, Berners-Lee wanted a way to share information about their research. By releasing his implementation to public use, he ensured the technology would become widespread. Subsequently, Gopher became the first commonly-used hypertext interface to the Internet. While Gopher menu items were examples of hypertext, they were not commonly perceived in that way.

An early popular web browser, modelled after HyperCard, was ViolaWWW. It was eventually replaced by, Mosaic in terms of popularity. Mosaic a graphical browser for the WWW, was developed by a team at the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign (NCSA-UIUC) and led by Marc Andreessen. Funding for Mosaic came from the High-Performance Computing and Communications Initiative, a funding program initiated by then-Senator Al Gore’s High-Performance Computing Act of 1991. Mosaic’s graphical interface soon became more popular than Gopher, which at the time was

primarily text-based, and the WWW became the preferred interface for accessing the Internet. The World Wide Web has led to a widespread culture of individual self-publishing and co-operative publishing.

Reading and vocabulary:

Look up and find the meaning of the words and the expressions: